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ABSTRACT

In an attempt to provide a framework for research and theory building in public management information systems (PMIS), state officials responsible for computing in personnel operations were surveyed. The data were applied to hypotheses arising from a recent model by Bozeman and Bretschneider, attempting to relate organization theory to management information systems in the public sector. Survey data are used to examine 10 propositions arising from the Bozeman and Bretschneider model and a research agenda related to these hypotheses is outlined. Survey findings bring into question the model's assumptions about the nature of the differences between private-sector management information systems (MIS) PMIS. The data are illustrated through 10 tables and 34 references are included. (Author/SM)

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Human Resource Management, Computers, and Organization Theory

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Human Resource Management, Computers, and Organization Theory

ABSTRACT

Data are presented from a fifty-state instrument undertaken in 1987 to survey officials responsible for computing in state personnel functions. Data are applied to hypotheses arising from a recent model by Bozeman and Bretschneider, attempting to relate organization theory to management information systems in the public sector. Survey data are used to examine ten propositions arising from this model and a research agenda related to these hypotheses is outlined. Survey findings bring into question the model's assumptions about the nature of the differences between private-sector management information systems (MIS) and public management information systems (PMIS).

Human Resource Management, Computers, and Organization Theory

Citing Jeffrey Moore's comment that management information systems (MIS) is a "practice in search of a theory" (Chronicle of Higher Education, 1986: 29), the editors of a symposium issue of the Public Administration Review recently sought to provide a basis upon which public management information systems (PMIS) theory might develop (Bozeman and Bretschneider, 1986a). Shortly after publication of this symposium, this author undertook a 50-state survey ((hereinafter called the "national survey") of PMIS managers in personnel administration in conjunction with a monograph of the International Personnel Management Association (Garson, 1987). The national survey was able to incorporate numerous items to test and amplify propositions advanced in the PAR lead essay on PMIS and organization theory. Some of these findings are presented below in the context of a research agenda for PMIS theory development.

In formulating items in the IPMA-related survey to test hypotheses pertaining to PMIS theory, the intention was not so much to refute or sustain the theories in question as it was to provide pertinent subjective data (that is, opinion survey data) from a relevant pool of practitioners. By its nature, such subjective survey data, however expert, cannot address fully many of the propositions discussed below. The first illustration, for example, deals with efficiency as a decision criterion. Perceptions by PMIS officials of the role of efficiency as reflected in a survey item may be different from its empirical role in actuality. While the national survey cannot substitute for extensive empirical research on each of the hypotheses to be discussed, its data do provide a useful preliminary filter raising questions about emergent theories of PMIS, at least as applied to human resource administration.

The national survey of human resource management (HRM) officials concerned with computing was undertaken by mail and telephone in Spring, 1987, with a response rate of 96%. That is, all states responded except West Virginia and Texas, which does not have a state division of personnel.

The Bozeman-Bretschneider Model

In attempting to provide a framework connecting research on PMIS to organization theory, the PAR symposium editors, Barry Bozeman and Stuart Bretschneider, focus on relating four dimensions in which public and private organization may be contrasted on the one hand, to a set of 10 PMIS "guidelines"

affecting policy on the other. These four dimensions include **economic factors** (e.g., the public sector lacks market failure criteria for decisions), **political factors** (e.g., the public sector is more subject to exercise of individual rights, appeals, and democratic processes), **work context factors** (e.g., long-range planning is more difficult in the public sector), and **personnel system factors** (e.g., the civil service system is associated with lower expectation of performance-reward linkage than are private personnel systems).

In founding their model on public-private differentiation, Bozeman and Bretschneider placed themselves squarely in the mainstream of most recent literature on computing in public administration as distinct from that in the private sector. The report of the Ad Hoc Committee on Computers in Public Administration of the National Association of Schools of Public Affairs and Administration, for instance, decried the lack of focus on specifically public sector materials on MIS and found it unacceptable to rely on computing courses in business curricula (Kraemer et al., 1986). Surveying texts on MIS, Luton noted with regret that few good materials existed on MIS impacts and theory in the public sector (Luton, 1986). Kirby (1987) surveyed literature on hundreds of MIS studies, concluding that political aspects of PMIS require a different literature and theory than that which arises for private-sector MIS.

The Bozeman-Bretschneider model is an important attempt at theory construction in an area in which, as Kirby (1987: 6-7) has shown persuasively, there has been little activity and in which the leading example, the framework set forth by Kraemer, has not become widely accepted in the literature. The Bozeman-Bretschneider model addresses several theoretic dimensions neglected in earlier work and is compatible with recent emphases on political factors and other unique aspects of public-sector management information systems.

In their model (hereafter called "the model"), Bozeman and Bretschneider (1986b) show how in each of the four dimensions above, factual differences between public and private sectors lead to specific PMIS policy recommendations. Below, data from the national survey are presented to provide a context for further research on the ten policy propositions advanced by these authors.

1. Economic Efficiency

In their first guideline, Bozeman and Bretschneider note that economic efficiency cannot be the primary criterion for evaluating MIS in the public sector. They give various examples of policy failures arising from failure to heed this injunction. Massachusetts AFDC computer cross-checking for fraud ignored due

process values and led to costly suits. Access to tax return databases by large numbers of mid- and lower-level IRS officials was blocked because it ignored privacy values. With unusual exceptions, the authors write, PMIS "performance evaluation based primarily on economic efficiency is inappropriate" (Bozeman and Bretschneider, 1986b: 483).

The national survey posed two items relevant to this guideline, shown in Table 1. First, PMIS officials were asked if they agreed or disagreed that the "Growth of computing in personnel in state government has come about mainly due to its efficiency." Secondly, officials were asked if "People have made significant political issues of computing in the personnel area in state government on issues like privacy, equity, or access to computer data."

The data show that nine out of ten PMIS officials believe that efficiency has been the primary criterion in their domain and most do not perceive other values as being significant issues. Of course, the Bozeman-Bretschneider guideline is prescriptive, not descriptive, and these data do no contradict the injunction that efficiency should not be the primary decision criterion. Moreover, the data show a significant minority, two in five, do perceive significant issues in HRM MIS even though they also perceive efficiency to be primary. In spite of this, however, the data raise a burden of proof on future researchers to demonstrate either (1) that officials are wrong in their perception, and values other than efficiency are primary; or (2) that officials are right, but policy failure has often been the result.

This finding may call to mind some reconsideration even of the examples given by Bozeman and Bretschneider. While it is undoubtedly true that in implementation of PMIS policies, as in other areas, failure can result from not taking proper value considerations into account, is it true that the examples given are indicative of general organizational experience? Or are the examples exceptions, not necessarily the best basis for constructing organization theory? Computer cross-checking of records has saved billions of dollars and is increasingly in widespread use, despite the Massachusetts AFDC example (cf. Government Computer News, 1985). Integrated information systems and networks are also becoming more widespread and give access to more bureaucratic workers, as in the major new systems for the Social Security System or for the Justice Department, problems with the IRS and privacy issues notwithstanding. Indeed, Bozeman and Bretschneider acknowledge this (1986b: 483-4).

The model states that efficiency should not be the primary evaluative criterion in PMIS, and if it is, significant policy failures will occur because other values are being neglected. The national survey shows, in contrast, that efficiency is seen as a

prime force, and other values are not unduly intrusive. This is consistent with other public sector studies showing users perceive computing to have increased their level of efficiency and productivity (Thompson, 1986).

The research agenda is this: in design decisions regarding PMIS, is the limited base of economic authority cited by Bozeman and Bretschneider such that efficiency criterion either is not primary or if primary results in failed policy? Or is efficiency the prime criterion in both the public and private sectors as regards management information systems decisions?

2. Side Payments

The second model guideline is that PMIS should avoid personal rewards or side-payments. Because managerial input is not linked as clearly to performance in public settings as in the private sector, it is argued, there is a greater tendency in government to engage in side-payments for performance. Specifically, in PMIS, managers who perform well may be rewarded with computer technology. This, in turn, can lead to "rapid proliferation of incompatible equipment and software due to lack of coordination" (Bozeman and Bretschneider, 1986b: 483.

In the national survey, PMIS managers were asked about the truth of the statement "Sometimes people in personnel have been given microcomputers or minicomputers as a 'side-payment' or reward for other activity rather than because it fits into an integrated computer development plan." As Table 2 shows, fewer than one in four perceived side-payments to be a phenomenon in their state.

The national survey data do show about one in five jurisdictions reporting existence of side-payments. However, over two-thirds of even in this minority of cases reported that HRD computing was growing according to an overall plan-approximately the same percentage as among those not reporting side-payments - contrary to the hypothesis that side-payments cause significant incompatibility problems. Of those reporting side-payments, none felt that the growth of microcomputers (a prime side-payment) had played a significant role in hindering efforts in personnel toward strategic planning and central coordination.

The agenda for future research on this guideline would be to determine if the perceived lack of importance of side-payments means that significant pressures for side-payments are being successfully resisted, or if the perception is wrong and side-payments are indeed important. Research might also address whether the origins of incompatible equipment in PMIS systems is often traceable to side-payments, as the Bozeman-Bretschneider

model would suggest.

3. Incrementalism

The third model guideline states that "PMIS planning should be incremental/contingent rather than holistic/rational" (p. 483). The justification for this is the greater need in the public sector to respond flexibly (and often) to changing political factors. In addition the annual budget process of most governmental jurisdictions also prevents effective long-term planning.

In the national survey, over two-thirds of the jurisdictions perceived that "Computing in personnel is growing according to an overall plan which considers tomorrow's needs" (See Table 3). Over three-quarters of the jurisdictions had a full-time individual whose job was to coordinate HRM computer services, and over half stated that all major state government departments had a full-time Information Resource Manager or equivalent. About three quarters of the jurisdictions also reported that when new computer applications are planned for HRM, a systems development life cycle approach was used, involving needs survey, feasibility studies, systems analysis, user sign-off on proposed changes, testing, redesign, and cost-benefit evaluation.

HRM MIS officials in the national survey were also asked if they felt computer services in personnel were inflexible. Fewer than a third perceived inflexibility as a significant problem. A majority of those reporting an overall plan and most of those reporting a single full-time coordinator felt inflexibility was not characteristic of their HRM MIS systems. Thus comprehensive planning for HRM MIS seems to be prevalent, and it does not appear to be related to perceived inflexibility, contrary to the model.

This finding may not be surprising. Planning can add to responsiveness and flexibility of MIS response, and lack of planning can lead to a system not capable of responding flexibly to demands on it, political or otherwise.

The research agenda in this area is to investigate the extent to which comprehensive MIS planning reduces responsiveness, flexibility, and sensitivity to political factors. Likewise, research may focus on the extent to which lack of planning enhances these values with regard to political changes and demands.

4. Extraorganizational Linkages

The fourth model guideline states that PMIS planning and design should anticipate as much as possible the need for horizontal and vertical linkages (Bozeman and Bretschneider, 1986b: 483). Whereas in the private sector MIS is said to be concerned primarily with internal matters, in the public sector PMIS database access is frequently a critical point of articulation of the bureaucracy with other governmental units and external actors. The relation of PMIS in motor vehicle agencies, police departments, and the FBI is one example of the kind of extensive interdependence rarely found in the private sector, Bozeman and Bretschneider assert. This line of reasoning is consistent with studies (cf. Berkman, 1984) showing the importance of relationships of PMIS units to other departments, as in determining the effectiveness of MIS implementation.

This is an area in which the national survey partially supports the model. More than four out of five jurisdictions reported that other government agencies accessed HRM databases (see Table 4). Approximately three quarters of the jurisdictions reported that computing had led to increased cooperation with other government agencies, and most perceived outside influences had played an important role in determining the nature of computer services in personnel (Table 4). Moreover, a substantial minority (about two in five) reported that even private organizations accessed HRM PMIS databases.

This support for the model is hardly surprising since state personnel databases by definition contain information on personnel of other agencies, agencies which must from time to time access the central database to get various reports for affirmative action, retirement planning, management development, and so on. Even private organizations access HRM databases for credit information, pay scale studies, and insurance transactions, for instance.

There seems to be little doubt that in the HRM area, PMIS is highly interdependent as the model prescribes. The research agenda in part is to determine the extent to which the interdependence found in HRM is typical of other governmental settings.

Much more important, and not addressed in the national survey, is research on comparison of the public and private sectors on MIS linkages. Credit, insurance, affirmative action, OSHA, sales, and many other forms of information exchange and reporting are very widespread in the private sector. A quick look at the hundreds of databases on services such as DIALOG quickly reveals how very extensive private sector MIS linkages are. Providing such linkages is a major industry in itself.

In fact, citing the linkage of American Airlines computers to hotel reservation systems, car rental firms, and other airlines, one recent analyst (Feldman, 1987: 12) has argued that external linkages are the key corporate battleground of the present and represent the "wave of the future" - not only in airlines, but in "everything from financial brokerage to stationery supply" MIS. Jerry Mechling, of Harvard's J.F.K. School of Government recently organized a conference on "strategic computing", citing the private sector lead in travel business computing and other areas where computing has changed significantly the relation of the agency to its clients and other external actors (SLAIR, 1987). While the model's prescription under this guideline seems sound, the derivation of the guideline rests on erroneous assumptions arising from the model's conception of public-private differences.

5. Chain of Command

The fifth model guideline recommends that the PMIS chief should not function at the top of the executive structure (Bozeman and Bretschneider, 1986b: 484). Whereas most MIS literature, based on private sector experiences, has found that success depends on direct support from the CEO (Ein-Dor and Segev, 1978), Bozeman and Bretschneider emphasize that public organizations are often headed by political appointees whose concerns can undermine long-term PMIS objectives.

In this guideline the model's prescription is opposite to federal policy, which calls under the Paper Work Reduction Act of 1980 for the establishment of high-level Information Resource Manager positions in each department. Bozeman and Bretschneider cite in their support the relative failure of the IRM structure to catch on, as well as studies showing relative lack of involvement by top local leaders in municipal PMIS (Danziger et al., 1982: 121). The Bozeman-Bretschneider model is consistent in this regard with studies such as that by Colton (1978), which found civilian domination of police computer implementation efforts was detrimental to innovation acceptance.

In the national survey, HRM PMIS officials were asked if the person who coordinates computing for personnel reported directly to a political appointee rather than a career administrator. While approximately one in three did so report, in the majority of cases reporting to a political appointee was not the case (see Table 5).

The implication of the model is that direct reporting by the PMIS head to a political appointee impedes PMIS strategic planning and development. Were jurisdictions under direct political supervision less likely to exhibit long-range planning? One national survey item asked PMIS officials if they believed

"computing in personnel is growing according to an overall plan which consider's tomorrow's needs". Contrary to the model's implications, by a ratio of about 6:1, jurisdictions under political appointees nonetheless reported such planning. In fact, opposite to the expectation of the model, the corresponding ratio among jurisdictions not directly under political appointees was only 2:1.[1]

Taking a more concrete measure of planning, PMIS officials were also asked, as defined earlier, if life-cycle planning were used in developing new computer applications. Of those jurisdictions under political appointees, life cycle planning was reported by a ratio of 14:1. Of those jurisdictions not directly under political appointees, life cycle planning was also reported by a majority, but only by a ratio of 5:2. Again, this is the opposite outcome from that predicted by the model.

The research agenda in this area is to investigate in which direction, positive or negative, the relation of political directorship to PMIS planning lies. It may be that political appointees, feeling not entirely familiar with a new environment, encourage PMIS planning as a way of "seeing the big picture" and feeling that they are in control. Moreover, this may well be an area under change, with works such as that by Marchand and Horton (1987) popularizing the managerial uses of information by CEO's.

Second, research is needed on the premise of this fifth guideline. In both the public and private sectors it is not uncommon for top managers to be buffered from PMIS heads through intermediaries such as management analysts and finance chiefs. Research might show that the dominant form of chain of command in both public and private organizations does not place PMIS heads directly under chief executives.

6. Ownership versus Leasing

The sixth model guideline prescribes a greater reliance on leasing of computer equipment in public organizations compared to private. This is because in the latter there is an incentive toward ownership due to tax benefits through depreciation as well as greater opportunity to receive the proceeds of sale of outdated equipment. Through leasing and time-sharing, government agencies may receive cost savings and increase flexibility.

In the national survey, PMIS managers were asked if "Leasing computer services is an important aspect of the overall approach of personnel toward computing". This was reported to be true by fewer than one-third of the jurisdictions (Table 6). While ownership was the dominant mode, leasing is thus not uncommon. Whether its extent differs from the private sector is a research question not addressed by either the national survey or by the

authors of the model.

With regard to computer sharing, in more than four out of five jurisdictions, computing was done on a mainframe housed in a department outside personnel, and all but two cases the mainframe used by HRM was shared with other units. Such sharing of mainframe resources is prevalent among departments in large organizations, both public and private.

From a research agenda point of view, this issue is among the most specific. Relative cost advantages of leasing and ownership vary by vendor, product model, and geographic area. Although the incentive structure is different between public and private organizations, public organizations also have incentives toward ownership, including support services from manufacturers. In fact, one of the main points of the literature on procurement centers on the use of RFPs, vendor conferences, and RFBs to exact greater advantages from vendors, usually manufacturers. Research may address the contingencies under which direct procurement is or is not advantageous compared to leasing, and whether the private sector differs from the public in this regard or with respect to which departments share mainframe resources. The greater development of microcomputing in the private sector may allow greater decentralization of MIS compared to PMIS, and consequently less sharing, but such a finding would not arise from the tax and economic premises of the model.

7. Time Frame for Testing and Development

In their seventh guideline, Bozeman and Bretschneider hold that PMIS requires a protracted period of testing and prototype development (Bozeman and Bretschneider, 1986b: 484). The argument is that the greater accountability and visibility pressures in the public sector require caution, whereas private sector organizations find "it is often better to act precipitously than to fail to act". The authors cite examples of lack of testing, such as the failure of a Georgia state prison computer system to list properly inmates eligible for parole, resulting in error and consequent outrage.

PMIS officials were asked in the national survey if "Speeding the introduction of software without adequate testing is a significant problem in personnel." This issue split evenly, with approximately even numbers on each side (see Table 7). This finding may reflect widespread complaints in both public and private organizations that new computer applications contain "bugs". Public managers are pressured by accountability toward caution and testing, but they are also pressured by annual budgeting and short politically-driven time frames toward speedy implementation (Garson and Brenneman, 1981a: 14-16). Examples of testing problems caused by undue speed coexist with complaints of

slowness in research, development, and implementation (cf. Huxhold, 1980). The PMIS manager must steer a difficult, compromise course, knowing criticism is as apt to arise from untimely implementation as from inadequate testing.

The research agenda with regard to development, testing, and implementation is partly factual. For comparable projects, is PMIS more characterized by cautious testing than private-sector MIS? This is an open empirical question since private-sector MIS officials have their own reasons for caution, just as Bozeman and Bretschneider cite for public managers. These reasons include the greater need to justify costs or oven operate as cost centers; the greater competitiveness for managerial positions and consequent desire to avoid being identified with mistakes; and the greater opportunity and precedent for testing, as in market research.

If the two sectors do differ, research is still needed to test the proposition that comparable errors resulting from inadequate testing are more severe for the PMIS official or the public agency than their private counterparts. Indeed, conventional wisdom holds that bureaucrats are more insulated from the consequences of their mistakes and that, ironically, private managers are the more accountable.

8. Managerial Control

The eighth model guideline states that "PMIS is generally not a useful means of enhancing managerial control" (Bozeman and Bretschneider, 1986b: 484). The authors argue that greater resistance to PMIS as a control mechanism arises in the public sector due to the greater importance of accountability in that arena. A study of 42 local governments by Kraemer and others is cited to show that top managers feel computers have had little effect on their ability to control units under their supervision (Kraemer et al., 1981: 55).

This guideline is significant because some past studies have shown that the desire to use computing and information technologies to increase managerial control is one of the central reasons for their application (Buchanan and Boddy et al., 1983). There is even some evidence that government officials have tended to invest in computer software that enhances executive control compared to software which provides direct services (Kraemer and Kling, 1985).

The national survey asked HRM PMIS officials if they perceived that computers had little effect on the ability of personnel managers to control. A surprising seven in ten disagreed with this statement (see Table 8). In an effort to be more concrete, officials were also asked if they thought it were

true or not true that computers had little effect on the ability of personnel managers to identify problems, abuses, or inefficiencies. Two-thirds disagreed with this contention as well. In human resource management, at least, PMIS officials do not perceive computers to be ineffective means of enhancing control.

Further exploration of this subject is found in responses of PMIS officials regarding whether they thought it was true or not true that computers had an important effect on the ability of personnel managers to monitor the performance of subordinates. Here a majority felt it was not true that there was an important effect in this regard (though over one third did perceive an important control effect). This indicates that control vis-a-vis individual performance is less attributed to computing than are broader administrative controls. There is considerable literature to suggest that computerized quantitative performance measurement systems are indeed subject to resistance and subversion, and may even backfire (Garson and Brenneman, 1981b, 1981c).

Broader controls may not always be exercised by the traditional authority. Another perspective on computing and managerial control comes from two other items in the national survey. Two thirds of PMIS officials disagreed with the assertion that computing in personnel has tended to reinforce the status quo, giving more power to those already powerful in the organization. At the same time, over half agreed that computing in personnel has tended to make some units or individuals more powerful than they would have been before computing (Table 8). Thus computing is seen as having complex effects on control, not always easily summarized by the simple dimension of increase/no increase. It may be that generalist top managers cited by Kraemer are less likely to perceive changed control relationships than are PMIS officials because the latter have greater understanding of how what is tracked in database systems helps determine how the organization perceives its internal and external environment.

The research agenda with regard to managerial control is to draw on the literature of studies of power structure to refine the concept of control and to differentiate it by function, level, and contingency. It is also still an open research question whether relationships of computing and control differ between the public and private sectors. Indeed, the model's guideline here is similar to the statement by Dearden (1983: 59) regarding private-sector top management, that "The computer has not added to the important information required by top management" - a statement much in controversy.

9. Labor Savings

The ninth model guideline holds that "PMIS should not be

rationalized on the basis of labor savings" (Bozeman and Bretschneider, 1986b: 485). This reflects common findings in both the public and private sectors that computerization is not likely to reduce labor costs, citing a study of local government by Danziger (1977) to underscore this point. The authors contend that PMIS differs from MIS on this point because of "the role of public jobs as a safety net", creating a constraint on personnel displacement in government.

The national survey found that slightly over half of the state HRM PMIS officials perceived computing to have reduced labor requirements, contrary to the model hypothesis. Nonetheless, a substantial minority - about two in five - stated that it was not true that labor requirements had been reduced (see Table 9). This finding is consistent with a recent national study of GFOA (government Finance Officers Association) members by Ostrowski, Gardner, and Motawi (1986:26-7), which found computing led to productivity increase in all functional areas surveyed.

The issue of labor savings is ambiguous. Studies such as that by Stephen Frantzich (1982) have shown that computerization does lead to efficiencies but may not lead to labor savings. For example, computerizing mass mailings is an enormous efficiency compared to hiring typists for the same purpose. Yet if computer mass mailing services are in effect, Frantzich noted, suddenly the demand for such services rises dramatically, perhaps to the point where more, not fewer, staff are needed. Is such a situation "labor savings"? In relative terms, the answer is yes because manual operation would require far more workers. In absolute terms, the answer is no because the organization winds up needing just as many, perhaps more staff.

The research agenda on PMIS in the area of labor savings is one located squarely in the well-established area of program evaluation, raising the issues of efficiency, effectiveness, and productivity measurement. Research is needed to understand better under what contingencies computerization increases efficiency, and under what contingencies greater efficiency leads to labor savings rather than increases in quality or quantity of output. Finally, research is needed to determine if these contingencies differ in the public as compared to the private sector. Is it true that use of public jobs as a safety net causes significant differences?

10. PMIS Personnel

Finally, the tenth and last guideline arising from the model holds that "PMIS personnel markets are less elastic and PMIS planning should be sensitive to constraints of nonmarket hiring" (Bozeman and Bretschneider, 1986b: 485). MIS is a highly

competitive job market and public organizations often cannot compete but instead serve as training grounds for individuals who soon leave for more lucrative private-sector employment. The authors quote a report of the National Association for State Information Systems, which for the third year in a row cited this as the most difficult external problem for state PMIS (State Government, 1981).

In the national survey, HRM PMIS officials were asked if they felt that "A major problem in computing in personnel is the difficulty of recruiting qualified computing staff." While exactly half agreed that this was an area of difficulty, a large minority - about two in five - stated it was not. When asked if it were true that salaries of computer staff in personnel are not competitive with the private sector", the proportion agreeing dipped to slightly under half, nearly the same as the proportion disagreeing (see Table 10).

Bozeman and Bretschneider concluded their article with an expression of belief that the differences between private sector MIS and public sector PMIS would increase with the passage of time (Bozeman and Bretschneider, 1986b: 485). The PMIS personnel picture may be one area where convergence, not divergence, is likely. One way to account for the apparent lesser urgency regarding personnel staffing in the national survey compared to state data cited by Bozeman is the time factor.

During the "microcomputer revolution" of the first half of the 1980's, some 40 million microcomputers were sold - more than 80 times the number of mainframe and minicomputers installed during the first 30 years of computing. As this revolution is institutionalized, and as the educational system churns out increased numbers of computer specialists, the recruitment-retention problem for PMIS may fade. For example, where a few years ago entering business managers rarely had computer skills, a recent report on business school curricula was headlined "Hiring MBAs? PC Literacy Is a Matter of Course" (Leeke, 1987; on MIS in the Harvard MBA, see Slack, 1986). The expanded pool in the private sector reduces pressure on the public, and public sector training is slowly following suit (cf. Kiel, 1986; Caudle, 1987).

The research agenda in this area is one of manpower forecasting. It is not clear that there is an intrinsic, enduring reason to differentiate MIS and PMIS on this point, though it is an obvious concern. In terms of testing the model, the issue is primarily one of documenting trends. Is PMIS staffing a major public-private difference of increasing importance and with more and more ramifications for public management, or is this a particular concern arising a few years ago but destined in the long run to be evened out by educational and job market forces, as the national survey suggests?

Conclusion

This essay has examined the lead essay in an important recent attempt to provide a framework for research and theory-building in public management information systems (PMIS). The theoretical framework advanced in the model was based on differences between the public and private sectors, and was used to deduce ten policy implications (guidelines). The ten guideline areas reflected insights common in MIS literature and were supported by relevant examples.

Empirical data have been presented to examine each of these ten deductions, based on a national survey of human resource managers involved with PMIS at the state level. At the start of this enterprise, the present author expected that data would provide support for the model's propositions, based as they were on common themes from the MIS literature. While the national survey was not without some support for the model, this author was surprised at the extent to which it brought aspects of the model into question at almost every point.

The test of a model's utility is the extent to which it may be used to generate interesting, testable, and valid hypotheses about the subject at hand. In discussing each of the ten guidelines, this essay has presented a research agenda for further investigation of the Bozeman-Bretschneider model. At this point, however, one may conjecture that a model of PMIS founded on the public-private differences outlined by the authors is not as promising an approach as might first be supposed in the endeavor to create a theoretical framework for research on public management information systems.

In this light, alternatives, such as that founded on systems theory (see Norris and Thompson, 1987) or policy analysis (see Kirby, 1987), should be explored in parallel with the research agenda presented in the foregoing pages. Such alternatives need not diminish the much-welcomed focus on political and other public management dimensions emphasized by Bozeman and Bretschneider, but theory construction along these lines requires recasting the conceptual foundations examined in this essay.

Table 1

Computing and Efficiency

	Item 61	Item 62
Value Label	Percentage	Percentage
True	54	23
True, Qualified	35	19
Not Sure	4	6
Not True, Qualified	0	13
Not True	4	38
No Response	2	2

Item 61. Growth of computing in personnel in state government has come about mainly due to its efficiency.

Item 62. People have made significant political issues of computing in the personnel area in state government on issues like privacy, equity, or access to computer data.

Table 2

Computing and Side-Payments

	Item 63
Value Label	Percentage
True	10
True, Qualified	10
Not Sure	4
Not True, Qualified	15
Not True	58
No Response	2

Item 63. Sometimes people in personnel have been given microcomputers of minicomputers as a "side-payment" or reward for other activity rather than because it fits into an integrated computer development plan.

Table 3

Computing and Incrementalism

	Item 64	Item 85	Item 86
Value Label	Percentage	Percentage	Percentage
True	33	58	29
True, Qualified	38	21	23
Not Sure	4	0	10
Not True, Qualified	8	4	4
Not True	17	17	33
No Response	0	0	0

Item 64. Computing in personnel is growing according to an overall plan which considers tomorrow's needs.

Item 85. The personnel function in this state has a full-time individual whose job is to coordinate computer and information services.

Item 86. All major departments of state government in this state have a full-time Information Resource Manager or the like.

Table 4

Computing and Extraorganizational Linkages

	Item 65	Item 66	Item 98	Item 99
Value Label	Percentage	Percentage	Percentage	Percentage
True	58	17	44	38
True, Qualified	25	21	32	23
Not Sure	2	4	13	8
Not True, Qualified	2	17	0	10
Not True	10	35	13	21
No Response	2	6	0	0

Item 65. Government agencies outside the personnel function use data personnel keeps on the computer.

Item 66. Private organizations use data personnel keeps on the computer.

Item 98. Computing in personnel has increase the ability of the personnel function to get cooperation from other agencies.

Item 99. Interests outside the personnel function have played an important role in determining the nature of computer services in personnel.

Table 5

Computing and Chain of Command

	Item 67
Value Label	Percentage
True	25
True, Qualified	8
Not Sure	2
Not True, Qualified	10
Not True	52
No Response	2

Item 67. The person who coordinates computing for personnel reports directly to a political appointee rather than a career administrator.

Table 6

Computing and Ownership, Sharing, and Leasing

	Item 68
Value Label	Percentage
True	25
True, Qualified	4
Not Sure	6
Not True, Qualified	19
Not True	44
No Response	2
Item 7	
Within personnel agency control	13
In another state agency	73
Not owned by the state	0
Don't know/no response	15
Item 8	
Used almost solely by personnel	4
Shared, but just with budget/payroll	4
Other sharing arrangement	79
Don't know/no response	13

Item 68. Leasing computer services is an important aspect of the overall approach of personnel toward computing.

Item 7. Where is (the mainframe computer used by personnel) housed?

Item 8. Is this computer ...

Table 7

Computing and Development Time Frame

Item 69

Value Label	Percentage
True	25
True, Qualified	19
Not Sure	15
Not True, Qualified	15
Not True	27
No Response	0

Item 69. Speeding the introduction of software without adequate testing is a significant problem in personnel.

Table 8

Computing and Managerial Control

	Item 70	Item 71	Item 72
Value Label	Percentage	Percentage	Percentage
True	8	23	13
True, Qualified	13	15	17
Not Sure	8	10	4
Not True, Qualified	17	15	19
Not True	54	38	48
No Response	0	0	0

Item 70. Computers have had little effect on the ability of personnel managers to control.

Item 71. Computers have had an important effect on the ability of personnel managers to monitor the performance of subordinates.

Item 72. Computers have had little effect on the ability of personnel managers to identify problems, abuses, or inefficiencies.

Table 9

Computing and Labor Savings

Item 73

Value Label	Percentage
True	29
True, Qualified	23
Not Sure	6
Not True, Qualified	10
Not True	29
No Response	2

Item 73. Computing in personnel has significantly reduced labor requirements.

Table 10

Computing and PMIS Personnel

	Item 74	Item 76
Value Label	Percentage	Percentage
True	33	25
True, Qualified	17	21
Not Sure	8	10
Not True, Qualified	21	23
Not True	21	19
No Response	0	2

Item 74. A major problem in computing in personnel is the difficulty of recruiting qualified computing staff.

Item 76. Salaries of computer staff in personnel are not competitive with the private sector.

Notes

1. Significance tests are not reported for data in this essay since such tests are appropriate only for random samples, whereas the national survey is based on enumeration. For all tables, survey size is 48. Percentages may not add to 100 due to rounding.

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